VŠB – Technical University of Ostrava
Faculty of Electrical Engineering and Computer Science
Department of Computer Science

Digital Advertising System

Systém pro správu digitální reklamy

2019 Hai Ho Le

VŠB - Technical University of Ostrava
Faculty of Electrical Engineering and Computer Science
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Bachelor Thesis Assignment

Student: **Hai Ho Le**

Study Programme: B2647 Information and Communication Technology

Study Branch: 2612R025 Computer Science and Technology

Title: Digital Advertising System
Systém pro správu digitální reklamy

The thesis language: English

Description:

The aim of this thesis is to develop web application based on modern web technologies. This system will be focused on digital advertising domain. The system will offer functionality to control and manage advertising content.

1. Describe nowadays technologies for development of web applications (especially from client side).
2. Analyze the requirements for specified system and describe the data model and functionality.
2. Design web application that will cover specified domain.
3. Implement this web application with utilization of selected modern web technologies.
4. Create basic user documentation of this information system.

References:

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Extent and terms of a thesis are specified in directions for its elaboration that are opened to the public on the web sites of the faculty.

Supervisor: **Ing. Michal Radecký, Ph.D.**

Date of issue: 01.09.2018

Date of submission: 30.04.2019

VYSOKÁ ŠKOLA BÁŇSKÁ-TECHNICKÁ UNIVERZITA Fakulta elektrotechniky a informatiky 1D16 OSTRAVA

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I declare that I wrote this thesis independently. I have listed all the literary sources and publications I have used.

In Ostrava June 20, 2019 ……..

Hai Ho Le

I hereby agree to the publishing of the bachelor's thesis as per s. 26, ss. 9 of the Study and Examination Regulations for Bachelor's Degree Programmes at VŠB – Technical University of Ostrava.

In Ostrava June 20, 2019 ……..

Hai Ho Le

I would like to thank Ing. Michal Radecký, Ph.D., for professional guidance of my bachelor's thesis, availability and advice in carrying out this work.

Abstrakt

Tématem této bakalářské práce je návrh a vývoj digitálního reklamního systému. Kromě vytváření digitální reklamy systém také pomáhá uživatelům propagovat své produkty přímo na svých webových stránkách. Moje diplomová práce se skládá ze čtyř částí: první část se zabývá analýzou trhu v porovnání se současnými typy reklamy; další část popisuje současnou technologii pro vývoj webových aplikací; třetí část popisuje podrobnou analýzu celého systému od návrhu databáze, popis požadovaných funkcí až po výběr technologie pro realizaci tohoto projektu; závěrečnou částí je realizace projektu.

Klíčová slova: Informační systémy, Systém pro správu digitální reklamy, ASP.Net MVC

Abstract

The theme of this bachelor thesis is to design and develop a digital advertising system. In addition to creating digital advertising, the system also helps users promote their products right on its website. My thesis consists of four parts: the first part is a market analysis, comparing to the current types of advertising; the next part describes nowadays technology for developing web applications; the third part describes the detailed analysis of the entire system from database design, describing the desired functions to selecting the technology to implement this project; the final part is the project implementation.

Key Words: Information Systems, Digital Advertising System, ASP.Net MVC

Contents

List of symbols and abbreviations

IS	–	Information System
MVC	–	Model View Controller
UML	–	Unified Modeling Language
HTML	–	Hyper Text Markup Language
CSS	–	Cascading Style Sheets
AJAX	–	Asynchronous JavaScript and XML
SQL	–	Structured Query Language
DnD	–	Drag and Drop
DOM	–	Document Object Model
SPA	–	Single Page Application
RIA	–	Rich Internet Applications
JSX	–	JavaScript XML

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1 Introduction

1.1 Problem

Nowadays, advertising is an integral part of the business strategy and market development of companies, corporations worldwide. They can pay a huge amount of money for this, the effectiveness of advertising is tremendous. Advertising helps to bring their products to the market in a vivid and specific way, increase the profit many times more than the amount used for traditional advertising.

Paper advertising is often boring, and creating an advertising video takes a lot of time and uses a lot of technology. For normal users, they often do not have the knowledge and ideas to create advertising for themselves. Users must hire an advertising company and search for an advertising environment for their products. And the cost of creating advertising is not small.

1.2 The goal of the job

This system will help users to shorten the time, as well as the cost of creating advertisements to promote the message they desire. Specifically, users only need to prepare resources (images, video, audio, messages, logos), this system will support users to create an advertising video based on the layout, the scenario which is available. Users can show their products on the system home page in a schedule. The creation and management of user resources are free, users only pay for the product presentation on the home page of the system.

2 System analysis

2.1 Approach method

The system will operate as a website for the convenience of everyone access, as they can use multiple devices to access the system. In general, there will be three roles in IS (administrator, user, guest), so considerations need to be taken to manage these roles, so that IS works as expected. IS will have a public part and a non-public part. For the public part, all objects can access this part. And the object with the lowest access is the guest. Guests will be able to see the advertising on the homepage to evaluate the quality of the product, perform some operations without logging in like sending a message to the support team, registering an account to become a user of the system, seeing information and related things about IS. The non-public part will require the right to login to IS. After logging in, guests will become users, in addition to other functions, users can create their advertising videos, edit information and be able to check the status of their products. In the system, there will be management functions, checking the validity of the data. The main function of IS is to create videos, show product videos on the system home page. In order to create an advertising video, users must first choose a brand of theirs (this will be good for brand protection as well as classification in IS). Next, users can create an advertising video with simple steps guided on IS. There will be two options in this step. The first option, users will create advertising videos from images. The second option, users will create advertising videos from videos. Also, input data can be their sounds, messages, product logos. IS will create an advertising video for users, and users can review and edit them. Next, users can use the product presentation function by selecting the time to show the product on the website according to a schedule. They will have to send a request to the administrator and wait for the administrator's approval if the user's advertising video does not violate the terms of the IS.

2.2 Database

In addition to the above functions, the system also needs a database to contain customer information, product information, and information of the brands uploaded to IS. Specifically:

- A database to store user data such as names, addresses, phone numbers and login information such as ID and password.
- A database to contain information about the brands in the system, to facilitate the edition and classification of products.
- A database to contain information about the available time that can show the user's product on the system home page.
- A database contains feedbacks from users and visitors to the administrator.

2.3 Data analysis

2.3.1 ERD - logical model

Figure 1 is a description of the structure of the ERD - logical model.

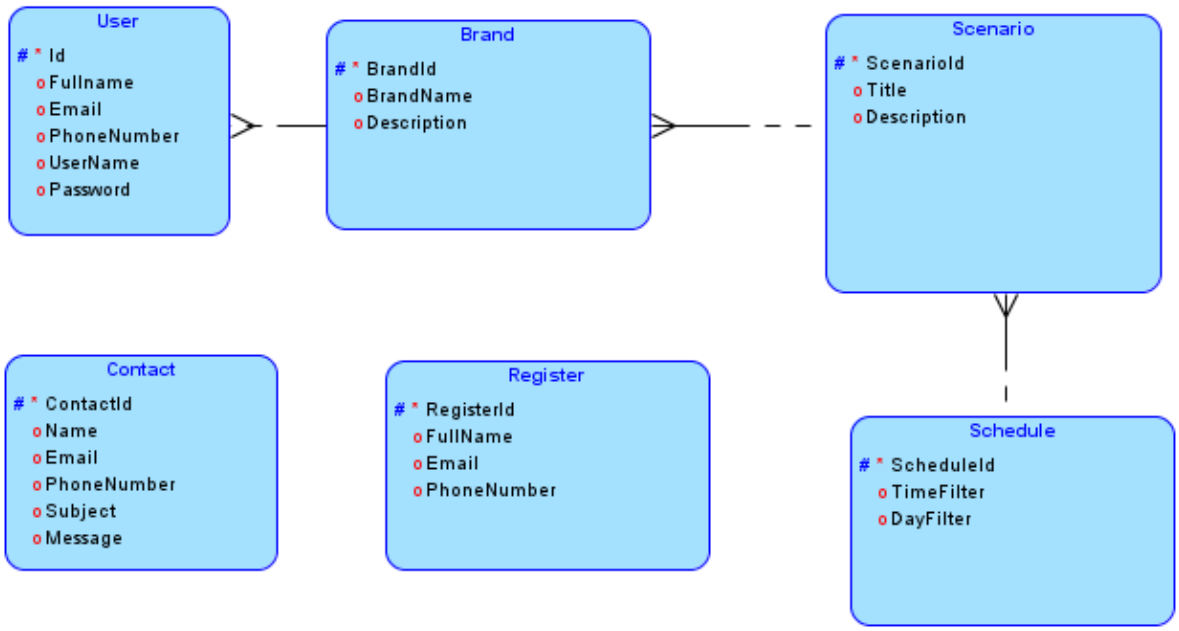

Figure 1: ERD - logical model

2.3.2 ERD - relational model

Figure 2 is a description of the structure of the ERD - relational model

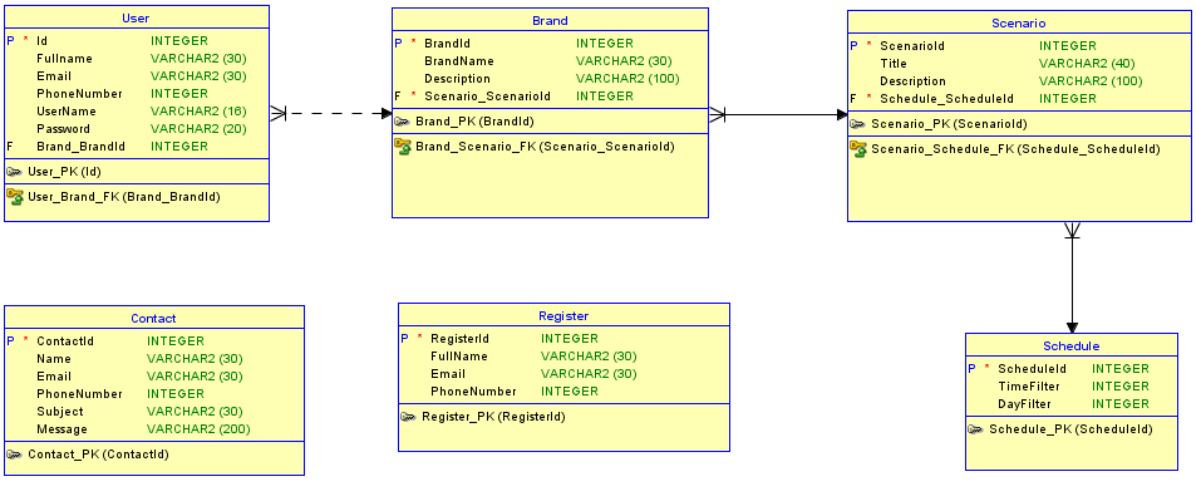

Figure 2: ERD - relational model

2.3.3 Data Dictionary

Below is the IS database. Table 1 will contain user data, Table 2 will contain data of brands, Table 3 will contain the information of the scenarios, Table 4 will be information about the schedule for video presentation, Table 5 will contain information about messages to the administrator, Table 6 will be information about the people who submitted the membership registration request.

Table 1: User

Attribute	Data type	Length	Not Null	PK	FK	Description
Id	Integer	-	Yes	Yes	-	Represents the id of a user
Fullname	Varchar2	30	Yes	-	-	Full nam of a user
Email	Varchar2	30	Yes	-	-	Email of a user
PhoneNumber	Integer	-	-	-	-	Phone number of a user
UserName	Varchar2	16	Yes	-	-	User name of a user
Password	Varchar2	20	Yes	-	-	Password of the user

Table 2: Brand

Attribute	Data type	Length	Not Null	PK	FK	Description
BrandId	Integer	-	Yes	Yes	-	Represents the id of a brand
BrandName	Varchar2	30	Yes	-	-	Full nam of a brand
Description	Varchar2	100	-	-	-	Information about the brand
Scenario_ScenarioId	Integer	-	Yes	-	-	Represents the id of a scenario

Table 3: Scenario

Attribute	Data type	Length	Not Null	PK	FK	Description
ScenarioId	Integer	-	Yes	Yes	-	Represents the id of a scenario
Title	Varchar2	40	Yes	-	-	Title of a scenario
Description	Varchar2	100	-	-	-	Information about scenario
Schedule_ScheduleId	Integer	-	Yes	-	-	Represents the id of a schedule

Table 4: Schedule

Attribute	Data type	Length	Not Null	PK	FK	Description
ScheduleId	Integer	-	Yes	Yes	-	Represents the id of a schedule
TimeFilter	Integer	-	Yes	-	-	The video presentation time
DayFilter	Integer	-	Yes	-	-	The video presentation day

Table 5: Contact

Attribute	Data type	Length	Not Null	PK	FK	Description
ContactId	Integer	-	Yes	Yes	-	Represents the id of a contact
Name	Varchar2	30	Yes	-	-	Full nam of a guest
Email	Varchar2	30	Yes	-	-	Email of a guest
PhoneNumber	Integer	-	-	-	-	Phone number of a guest
Subject	Varchar2	30	Yes	-	-	U Subject to discuss
Message	Varchar2	200	Yes	-	-	Message to discuss

Table 6: Register

Attribute	Data type	Length	Not Null	PK	FK	Description
RegisterId	Integer	-	Yes	Yes	-	Represents the id of a user
FullName	Varchar2	30	Yes	-	-	Full nam of a user
Email	Varchar2	30	Yes	-	-	Email of a user
PhoneNumber	Integer	-	-	-	-	Phone number of a user

2.4 Functional analysis

2.4.1 System Users

- Administrators

  Administrators are the highest authority in IS. This role will have full functionality of the IS. The main task of this role is overall management and monitoring of IS functions. Administrators can add, delete, edit user information, brands and products if necessary.

- Users

  Users have all the functions with their information, brands and products. Users can edit their information, add new brands and their products. Submit their product presentation request and wait for administrator approval.

2.4.2 System functions

Most of the IS functions will be presented in a number of lines along with a description of their functions. Functions can be divided into two parts, not public and public. The non-public part is the only part for administrators and users. This part will provide a system management interface. The public part is for guests.

2.4.2.1 Private part

2.4.2.1.1 The functions are available only for the administrators

- List of users

  Display the list of users and users information.

- Register new users

  Administrators can add a new user by entering their information, along with the login account name and login password. Or based on guest registration requirements, to create a new user account.

- Edit users

  Administrators can edit all users information.

- Delete users

  Administrators can remove all users in IS.

- Create brands

  Administrators can add a brand if necessary, or get an offer from that brand.

- Edit brands

  Administrators can edit all brands information.

- Delete brands

  Administrators can remove all brands in IS.

- Create new schedule

  The administrator can create a new time frame to show the user's product.

- Edit schedule

  The administrator can edit all time frames so that IS can work most effectively.

- Delete schedule

  Administrators can remove a schedule in IS.

- Create new scenario

  Administrators can add new scenario in IS.

- Edit scenario

  Administrators can edit all scenarios information.

- Delete scenario

  Administrators can remove all scenarios in IS.

2.4.2.1.2 The functions are available for users and administrators Users can only edit their brand and product information. Administrators can edit all information of all brands and products in IS.

- List of brands

  Display the list of brands and brands information.

- Create product

  Users and administrators can create an advertising video and use the tools to perform this function.

- List of products

  Display the list of products and products information.

- List of schedules

  Display the list of schedules and schedules information.

- List of scenarios

  Display the list of scenarios and scenarios information.

2.4.2.2 Public part The functions are available for guests

- List of brands

  Display the list of brands and brands information.

- Create a contact form

  Guests can create a contact form to contact the IS administrator.

- Create a new member registration request

  Guests can create a request for the administrator to create an account for them. Account information will be sent by the administrator by email to the guest after the administrator has created the account.

2.4.3 Activity Diagram

Figure 3 is the main and important function of the system: Create a advertising video.
Actor: Administrator, User
Condition: Logged in
Scenario:

- Select the scenario that matches the user's input.

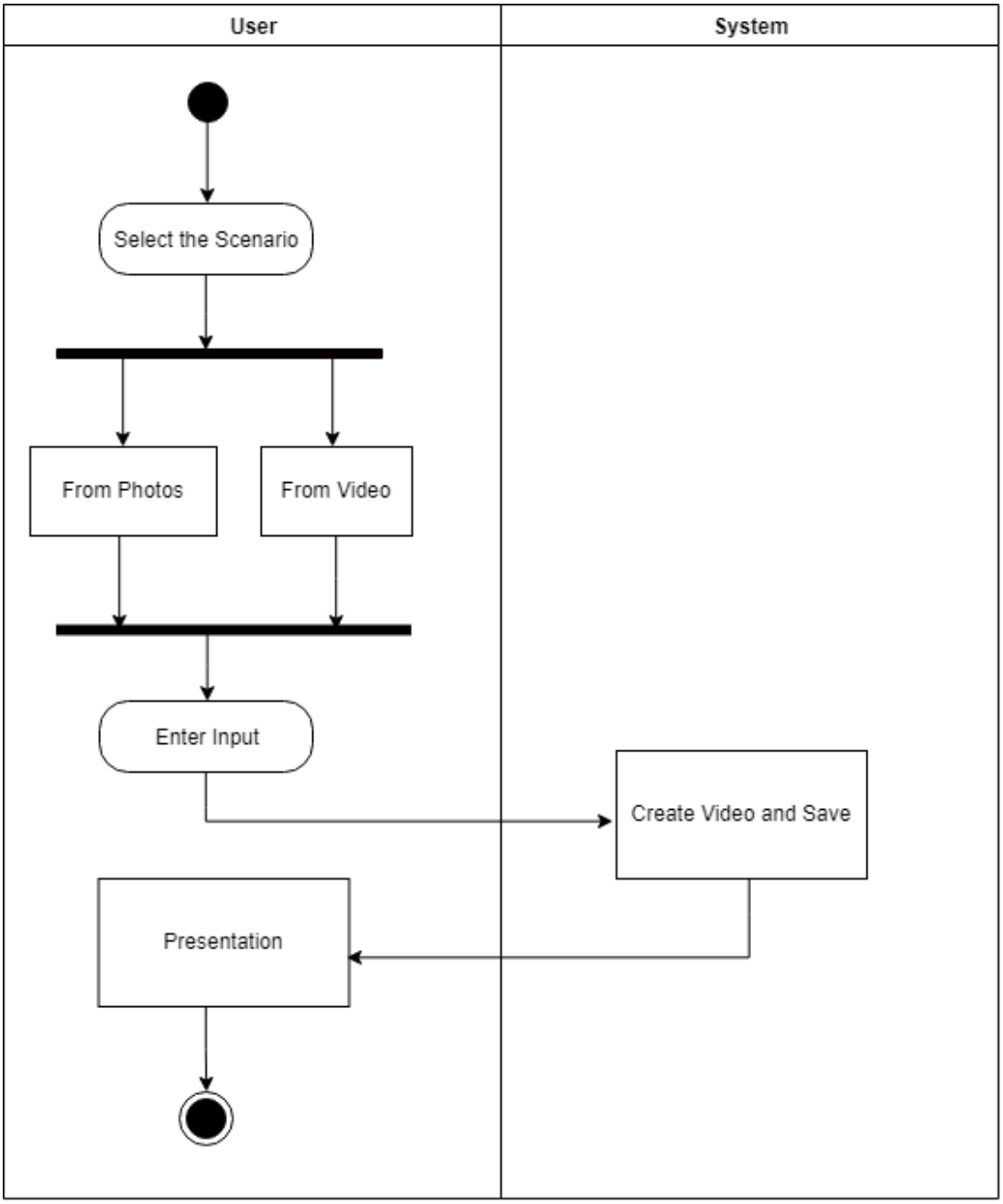

Figure 3: Activity diagram - Create a advertising video

  - Select the script, create products from available videos.
  - Select the script, create products from available images.

- Enter the slogan that we want to promote and select resources (sounds, images, videos, logos).

- The system creates advertising videos and saves them in folders, ready for presentation.

3 Modern Technology

3.1 Benefits of web technology

The concept of the website was formed in the 90s when the browser went into the finishing stage and developed strongly like today. There is no reason why we are skeptical about the benefits that web technology brings to us as well as to the development of the present and future world. Web technology can completely replace existing desktop applications. Instead of a company with hundreds of computers and having to install hundreds of similar Desktop applications, we can install only one web application for everyone to use, not only at the company but also for people who work at home. All exchanges will take place in the web environment, these jobs have now been done based on web technology and software connected on the internet environment, but this is not common. We can fully believe in a strong future of web technology development[1].

3.2 Technologies for the development of web applications

At the present time, people not only work on the local machine, and w ith the browser, but have to work with the Server, Web Server software. When a user runs a web application, they are using a Client-Server-style application. This means that the application will include processing in two places: at their machine (Client machine) and at the Server. In a Client-Server-type network application, Client-side is the activity that occurs at the client's browser (the user's computer). In a Client-Server-type network application, Server-side is the operation that occurs at the Server. Typically, the Server can be a computer program, for example, Web Server software running on a computer elsewhere[2].

3.2.1 Client Side Programming

The processing scripts written here will run locally on the browser and operate system on the user's computer. The common scripting language for client programming is JavaScript and the user's computer needs to have a JavaScript interpreter to work with these scripts.

When the browser downloads the web page, these scripts can also go as a part of the web page, which makes the user's web surfing better. For example, during processing the user's task, the site needs to perform a calculation, then the script will perform that calculation right on the user's computer instead of sending data to the Server and waiting for the results to be returned.

The problem with these scripts is that they are limited to processing (which means that it can only be used for certain processes) and depend heavily on the user's operating system and browser. Because developing a website related to users with a multitude of software options is very difficult for developers to control errors and compatibility issues with the browser that may arise[3].

3.2.2 Server Side Programming

The processing scripts on this side will be executed on the server and will return the results to the client via the network. The common scripting languages used for server-side programming are PHP, C#, VisualBasic.NET. These processing scenarios minimize the number of errors and compatibility issues because the code in the script will run on a server using a certain language and a certain hosting (Web hosting) software. Therefore, when selecting the server to host the website, it is important to consider whether the server is pre-installed and it supports the language we use.

Server-side scripts are used to access processes or resources on the server, such as a database. When we want to retrieve the server's data access, our requests will be forwarded to these processing scripts so that they perform database queries and will return to our browser the results of that query.

The server-side script has bigger advantage in security than the client scripts. For example, when we access an online bank account, the server-side script will communicate with the client with encrypted messages. While the client-side script is just plain text, running on the local machine. Any "bad guys" can see code, eavesdrop and steal personal information from our computers.

Another notable advantage of server-side scripting is compatibility with users' browsers. Most browsers now allow users to "disable" executing client-side processing scripts (JavaScript) to prevent hackers from attacking, but this causes problems for programmers. So users who want JavaScript to run on their computers, they have to download the Web applications completely. As for the server side script, there is no limit.

The main disadvantages of the server side script are high cost and time consumption in receiving queries from users. In addition, the errors in the script can cause the entire server system to hang[3].

3.3 Programming language

3.3.1 Server-side

Server-side programming language, is the common name of the programming languages running on the Server[4].

Use:

- Processing user input (user input data).
- Display page.
- Refactoring a web application.
- Interact with permanent storage (SQL, file).

For example:

- PHP
- ASP.Net in C#, C++ or Visual Basic.
- Almost languages (like C#, C++, Java). These languages are not specifically designed for web applications, but most web applications today use these languages to write on an application-level web service.

3.3.2 Client-side

Like the server side, the client-side is the common name of the languages running on the Client. Use:

- Create interactive pages.
- Make the web more vivid with dynamic components.
- Interact with temporary storage, and local storage (Cookie, localStorage).
- Send a request to the Server and receive feedback from it.
- Provide remote services for client-side applications, such as copyright registration, content submission, or multiplayer games.

For example:

- Javascript (most popular).
- HTML *.
- CSS *.
- Any language running on the client device that interacts with the remote service is called the client-side language.

3.4 The main technology for web development

Below will be the most popular web development technologies today, I will only focus on web-client technologies. Figure 4 is typical for the three most popular web programming languages today.

Figure 4: HTML5, CSS and JavaScript

3.4.1 HTML5

3.4.1.1 What is HTML5? HTML5[5] has been upgraded from HTML (Hyper Text Markup Language: is the hypertext markup language, used to present objects on the browser), allowing the creation of web pages that work well across different multiple browsers, and also significantly improve processing speed as well as display.

Different browsers will display the web page in the way they created the browser, and smart devices such as phones, tablets, laptops or desktops,... will also display the website according to many different forms. Previously, for programmers, making the website work well on all browsers, or creating different versions of the website to display well on handheld devices,... require certain experiences. Now, with the advantages of HTML5, that difficulties have been solved almost thoroughly which brings a lot of benefits for the developers.

3.4.1.2 Some new features of HTML5

3.4.1.2.1 Flexible syntax rules The HTML5 language has a customized syntax that is compatible with HTML4 and XHTML1 documents published on the Web, but it is not compatible with HTML4's that owns SGML features[5].

HTML5 has no general syntax rules like XHTML, as we need tag names to be lowercase, an attribute must have a value and all empty elements closed.

But HTML5 has more flexibility and will support the following:

- Uppercase card names.
- Quotations are optional for attributes.

- The value of the attribute is optional.
- Closing empty elements are optional.

3.4.1.2.2 Web socket One of the common aspects of web applications is real-time communication, updates happened in the background without reloading the page. This issue has so far been resolved in many different ways, but the major drawback is often the high traffic costs of those solutions. But HTML5 comes with an API in its WebSockets API that can solve this frequent problem in the best possible way[6].

3.4.1.2.3 Store in HTML5

- Web Storage

  With HTML5 web storage, the website can store data at the client (client browser). Before HTML5, we had to use the JavaScript function about cookies to do this.

- HTML5 Application Cache

  HTML5 introduced the application cache, which means that a web application is temporarily stored and accessible without an Internet connection.

- HTML5 History

  When working with the browser, we visited many different pages (URL). The browser has API to access and manipulate the resulting URL history using window.history object.

3.4.1.2.4 HTML5 File API HTML5 File API provides us methods to interact with the file on the Client side to access the file's basic information[7]. It is easy to understand that we can interact with the file's information, render it right in the browser without uploading it to the Server.

HTML5 File API allows us to read, write data to the file and detect the presence of file APIs by algorithms supported in HTML5.

3.4.1.2.5 Drag and Drop Drag and Drop(DnD) is a powerful User Interface concept that makes it easy to copy, reset, and delete items with the help of clicks. This allows clicking and holding the mouse button to move to an element, drag it to another location, and release the mouse button to release the element at that location[8].

To implement this drag and drop feature in traditional HTML4, programmers will either have to use complex Javascript programs or other Javascript frameworks like jQuery.

Now, HTML5 launches the DnD API solution that brings DnD support naturally to the browser, making it easier to encrypt.

HTML5 DnD is supported by all major browsers like Chrome, Firefox 3.5 and Safari, ...

3.4.1.2.6 New syntax/structure elements in HTML5

HTML5 brings new elements to better text structure. As a result, user actions become much faster than before.

3.4.1.2.7 Graphics and multimedia in HTML5

- HTML5 Canvas

  Canvas is an HTML5 tag similar to other HTML tags, but the most obvious difference is that the content of Canvas is built from Javascript. To use Canvas, we have to put the <canvas></canvas> tag at the position we want to display, then use the APIs that HTML5 provides to manipulate objects inside Canvas (line, circle, ...)[10].

  When using Canvas, we must understand the difference between the elements of Canvas and its content. The Canvas element is just a regular HTML tag, but its content is a collection of objects that make up a Graphic.

  When displayed on the browser, the Canvas will be displayed as a png image.

- HTML5 SVG

  SVG stands for Scalable Vector Graphics, it is drawn using a markup language like HTML. It offers a number of methods to draw like lines, circles, images, text ... SVG is a kind of vector image, not based on a pixel basis, which means image quality does not change when zoomed in or out. SVG format does not allow you to edit videos, draw three-dimensional graphics. Thanks to HTML5 SVG, the programmer can draw lines, circles, rectangles, ellipses, multi-faceted shapes, polygons,... In addition, HTML5 SVG also helps developers create animations, inserts text into SVG,...

  Most web browsers can display SVG like they can display PNG, GIF, and JPG. IE users may have to install Adobe SVG Viewer to be able to view SVG in the browser.

- Audio

  Based on the name of the card, we get to know the use of this tag. With <audio> tags, programmers can quickly insert their favorite music into their website. This tag is very simple to use, very similar to using the <img> tag, we just have to insert the src attribute as the path to the audio file we want to share.

```
<audio src = "audio.mp3" controls>
</audio>
```

Listing 1: Html Audio

  The audio card also supports a lot of options for programmers. Here are a few options for this tag :autoplay. With this option, your website will automatically play audio files. When you add the loop="loop" attribute, the audio file will automatically playback at the

end. The preload="auto" attribute allows browsers to automatically buffering all audio files to your computer without the user having to click the Play button. This is beneficial that users can enjoy audio files without being jerky when the transmission is slow, or broken in the middle.

- Video

  <video> tag to play video and movie files. How to use <video> is quite similar to <audio>. Developers can use height/width attributes to determine the height and width of the video file. If our video does not work, instead of being a black screen with errors, we can use the poster attribute. An image as a poster will display, used as an alternative to this video.

```
<video controls>
   <source src = "video.mp4" type = "video / mp4">
   <source src = "video.ogg" type = "video / ogg">
</video>
```

Listing 2: Html Video

There are currently 3 video file formats supported in HTML5: mp4, WebM, ogg.

3.4.1.2.8 Other API (HTML5 Geolocation API) HTML5 Geolocation API let you share your location with your favorite Websites. A Javascript can capture your latitude and longitude and can be send them back to the Web server and perform location recognition such as searching for local businesses or your location on the map.

Today most mobile browsers and devices support Geolocation API. Geolocation API works with a new attribute of the global navigation object.

3.4.1.3 Advantages of HTML5 From the new features in the 3.4.1.2.1 part, we can see the powerful capabilities of HTML5 in the present and future. It completely changes the way of website programming. HTML5 makes everything simpler and easier, making the website better and more flexible as well as shortening the time to create the programmer's website. Some outstanding benefits of HTML5:

- New design tool

  HTML5 makes Web applications and Web sites more attractive. HTML5 has new features added that makes web application building a lot easier. For example, there are more colors and curves, blurring and rounded corners are also supported (web designers used image files to create rounded corners in their web pages before). All of this makes a Web site more beautiful, realizing what the designer imagines.

- Compact source code and new bookmark tag

  HTML5 helps us optimize HTML source code in previous versions, in a clearer and more compact way. The first feature of a markup language is creating the tags. At this point, HTML5 has added many new things, from content organization tags (article, aside, title ...) to interactive support tags and multimedia (video, audio ...). HTML5 also introduces a concept called semantic markup, meaning that the tags are semantic. These cards come from surveying websites and identifying some common naming habits (some parts of the site are usually given a name such as "header", "footer", "nav"). Besides, using semantic markup can also be advantageous when future search engines taking advantage of them to classify results. In addition, HTML5 <form> tag is also considered a major improvement, all the functions you need (format, validate data ...) have been built directly into HTML. We no longer need Ajax, Flash or other support technologies to do this work.

- Integrate Video / Audio features and reduce the use of external plugins

  In previous versions, developers often had to use third-party programs, such as Adobe Flash Player, Quicktime or Silverlight to embed video or audio into their websites. These methods are often not compatible with all browsers and sometimes fail to fix easily and difficult for website programmers to choose which program to run the video/audio. HTML5 easily solves this problem by integrating libraries that support audio and video. The syntax for embedding video or audio into the website is extremely simple with many attributes attached. Thanks to this new feature, the system's resource occupation are significantly reduced, making the computer work faster and browsing smoother.

- Offline Caching

  Offline Caching is a new feature that stores offline cache in the browser, allowing users to continue viewing the content of the viewed pages without being online. With HTML5, administrators can define exactly what files are needed to save data in the browser. This also helps the website to save bandwidth and speed up web browsing for users.

- Mobile optimization

  Mobile optimization is an advantage of HTML5, making it better to display web application interfaces and mobile apps. The websites are easily built in HTML5 through integrated intermediary frameworks making it possible to display the interface on all devices with different screen sizes.

- Operability on browsers

  HTML5 provides simpler declarations and a powerful API comparing to previous versions. HTML5 can work well on popular browsers such as Firefox, Internet Explorer, Chrome, Safari and Opera.

3.4.1.4 Disadvantages of HTML5 HTML5 is a revolution for web programming so it has no disadvantages. When it was first developed, the only disadvantage of HTML5 was that it was not popular, so some browsers still did not support it. But at the present time, modern web browsers have supported HTML5, so it can be said that the only disadvantage of HTML5 has been removed.

3.4.1.5 How to use HTML5 The Figure 5 shows how to use HTML5, all the functions and methods of syntax implementation of previous HTML versions are kept in HTML5, but greatly simplified so that the HTML5 implementation has become faster. New features in HTML5 mentioned in the above parts make programming even more amazing. When not dependent on plugins, it helps to reduce user resources and speed up the browser.

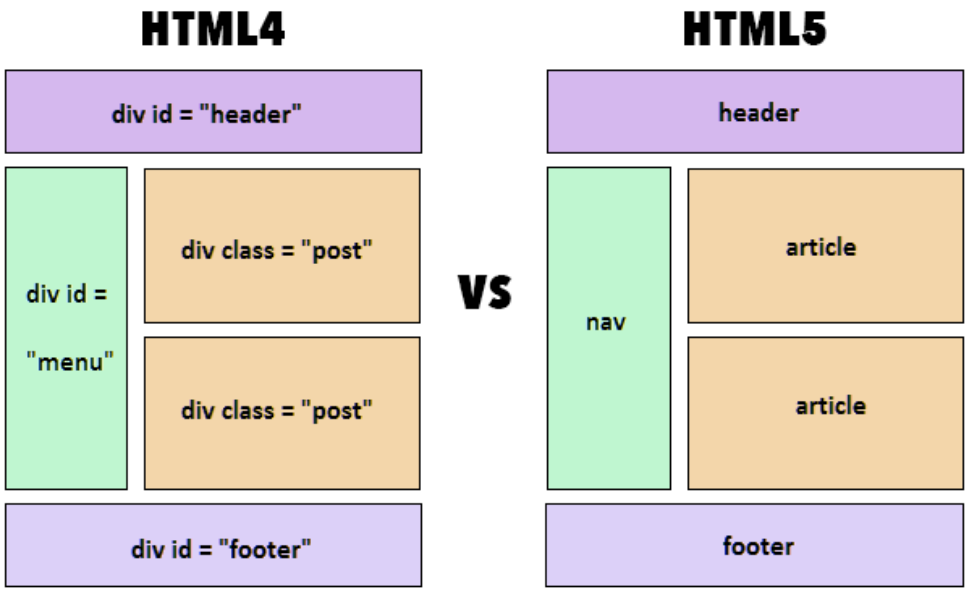

Figure 5: How to use HTML5

3.4.2 CSS3

3.4.2.1 What is CSS? Cascading Style Sheets (CSS) are files that support the web browser in displaying an HTML page[11]. Before CSS appears, HTML is used to specify the format of a web page. The problem here is how to change the style of a website - for example, how to change the color of different "buttons"? HTML will have to change a lot of places in the web application. CSS was invented to solve these problems by separating the content of the site from its design (sometimes overlapping). A web application can be linked to a set of CSS pages to set the style for the entire web application. Then, if we want to change the color of a button, we will need to only modify a CSS file and all the buttons for the entire web application will change. There are many things we can do like changing the layout of a web page, making elements of a

web page slowly disappear, slowly show up, changing the font-size of the text, create effects ... and anything we can imagine.

CSS3 is the latest version of CSS Properties.

3.4.2.2 Some new features of CSS3

3.4.2.2.1 Pseudo-Class in CSS3 Use Pseudo-Class to select elements in CSS3 with commonly used Pseudo-Class, example :first-child: or :last-child. The pseudo-class technique allows you to style elements and elements of an element in an HTML tree without using JavaScript. A pseudo-class begins with a colon " : ".

The pseudo-classes included in the CSS3 library are very rich and diverse. Meet most of the programmer's needs.

3.4.2.2.2 Font In the past, if you wanted the website to run a new front that were not installed on the client's computer, it was impossible, unless the client download and install it on their computer.

This problem has been fixed by CSS3 by adding a rule called @font-face, which creates a naming font and points to a font file stored on the Internet. This has helped the designers to unleash their ideas without worrying about the font format problem anymore.

Using @font-face is like a CSS attribute with multiple attributes combined with the font format to create font types at the discretion of the steward.

For example:

```
@font-face{
    font-family: MyFont;
    src: url(sansation_light.woff);
    font-weight: 100;
}
h2{
    font-family: MyFont;
}
```

Listing 3: CSS3 @font-face

The path points to the font file you can use Google's CDN or directly on your host.

3.4.2.2.3 Attribute selector Attribute selector is the way to select elements you want to style in HTML documents based on the attributes of one or more HTML tags.

Attribute selector can select objects without having to declare additional Classes or IDs into HTML tags and still be able to navigate those components, making the code neater and more coherent.

3.4.2.2.4 New text feature

- CSS3 Multi-column

  CSS3 supports the Multi Column feature to help you organize your text as an article structure.

- CSS3 Text Processing

  CS3 supports a number of attributes that make text processing more efficient. If we have previously had difficulty processing a word that is too long and overflowed with HTML tags, then using CSS3 will solve it.

3.4.2.2.5 CSS3 Transforms

- CSS3 2D Transforms

  CSS3 2D Transforms are attributes used to handle 2D moving effects (two-dimensional space), for example, you can use CSS3 to rotate an HTML tag at a 180-degree angle, or drag and pull to a large extent when hovering over HTML objects,... All these effects in two-dimensional space are called 2D Transforms.

  The syntax for creating transforms is as follows: transform: value;

- CSS3 3D Transforms

  Using 3D Transform in CSS, you can move elements in three axes: x, y and z. Values are the same as CSS3 2D Transforms but the way to implement the syntax changes.

- CSS3 Animation

  CSS animation is the technology introduced in CSS3 version. It allows us to create motion effects without using Javascript or Flash. Make the website more lively and attractive.

3.4.2.3 Advantages of CSS3

- Clear and easy to understand

  CSS3 was developed to increase compatibility with HTML5 in the layout of content presentation. Now that HTML documents have a very clear and understandable layout, CSS properties and HTML tags are no longer overlapped but separated by rows "class" and "id". This makes it easier for developers to add and edit interfaces according to their ideas.

- Screen compatibility

  CSS3 Media Queries supports compatibility with many different screen sizes without editing the display content, increasing the flexibility of the application, making the user experience more wonderful.

- Remove unnecessary code

  In addition to supporting the interface, CSS3 helps us shorten the code in HTML when using attribute tags in HTML is no longer necessary. CSS3 strengthens HTML by arranging a more scientific, logical and easily tracked of tags than before.

- Consistency

  By using a single CSS file, we will always be sure of the interface synchronization between different pages in the same website. Also, when you want to change the look of the website, you just need to change it in that CSS file.

- Popularity

  CSS3 is the language supported by most browsers in the world. And it shows a website on many different browsers very similar.

3.4.2.4 How to use CSS3? Using CSS3 is the same as previous versions, but the way to implement the code is easier to understand. There are 3 ways to insert CSS3 into the website.

- Declare in a separate file.

  We will create a separate file with the .css extension and inside it is all CSS code, this way makes it easy to apply CSS code to many different pages.

- Insert CSS code in HTML document.

  This applies to the case where this CSS code is only for that HTML document. Then, our CSS code will have to be placed in the <style> tag and placed in the <head> part.

- Insert CSS code directly into the tag of HTML (inline style).

  Inline style is used a lot in case a certain HTML tag needs its own style.

Listing 4 will show how to use the Pseudo-Class in CSS3 to set the format for the first paragraph in a block with id is a parent:

```
<style>
    #parent p:first-child {
        color: green;
        text-decoration: underline;
    }
</style>

<div id="parent">
    <p>ABC</p>
    <p>123</p>
```

```
    <p>XYZ</p>
</div>
```

Listing 4: Pseudo-Class in CSS3

Figure 6 is the result of the code above. The first paragraph will be in underlined text and the font color is green

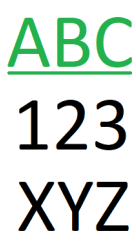

Figure 6: Result of Pseudo-Class

3.4.3 JavaScript

Javascript[1] is a dynamic computer programming language. Javascript is embedded or integrated into HTML files, used to create scripts on client and server machines. Client scripts are executed at the browser and server scripts are executed on the server. JavaScript and Java are two different languages, in both conceptual and design. JavaScript was invented by Brendan Eich in 1995 and became an ECMA standard in 1997. ECMA-262 is its official name. ECMAScript 2016 (June 2016) is the latest version of JavaScript.

3.4.3.1 What is JavaScript? JavaScript is the HTML and Web programming language. JavaScript is an object-based scripting language to develop Internet applications running on the client and server side[12]. Javascript is very useful in building HTML systems that can interact with users.

3.4.3.2 Advantages of Java Script JavaScript is one of the three languages used by all web developers to develop and in the future, it will still be an integral part of web programming technology. Some advantages of JavaScript:

- Run on the client side

  This means that the code is executed on the user's processor instead of the web server thus saving bandwidth and stress on the web server.

- A simple language

Javascript is relatively easy to learn and includes the syntax that is close to English. It uses the DOM model that provides many features written for different objects on the pages to help you easily develop a script to solve a specific purpose.

- Quick interaction for users

  When the code is executed on the user's computer, the results and processing are completed almost immediately depending on the task (the task in javascript on the website is usually very simple). There is no need to be processing requests in the web server of the site and sending it back to the user because it consumes the bandwidth of the client and the server.

- Additional features for websites

  Third-party plug-ins such as allowing Javascript developers to write JavaScript code snippets that can be executed on desired websites to extend its functionality. If we use the site and request a feature, we can write it ourselves and use a plug-in like Greasemonkey(Plugin on Firefox) to run it on the site.

- Richer interface

  We can use JavaScript to create items such as Drag and Drop (DnD) and sliders to provide a feature-rich interface to our guest.

3.4.3.3 Disadvantages of Java Script When the JavaScript code is executed on the client machine, it seems to run immediately and therefore it can also be used to exploit the user's system. Although certain restrictions are set by modern web standards on browsers, malicious codes can still be run on users' machines.

JavaScript does not have any multi-threading or multi-processing capabilities. If these capabilities are available, it will greatly speed up the browser.

3.4.3.4 The syntax of JavaScript For example:

```
function myFunction(p1, p2) {
  return p1 * p2; // The function returns the product of p1 and p2
}
```

Listing 5: The syntax of JavaScript.

JS's basic operations are quite similar to other programming languages like C / C ++ or Java.

- Variables and data types: How to declare variables of javascript consists of 2 parts: variable name and variable value. example: string name;

- Basic operators: Javascript fully supports basic addition and subtraction operations. There are also two new operators, ++ (increasing the value of the variable to 1 unit) and – (reducing the value of the variable to 1 unit).
- Comparison operators: In Javascript, the results of all comparisons are a boolean variable: either true or false. For comparisons between variables or expressions, you can use === for equal comparisons, !== for non-equal comparisons, < and > comparisons for poorer comparisons.
- if...else: To make choices in Javascript, you will use the if keyword or if ... else.
- Loop: For basic Javascript, there are two ways to create loops: for loops and while loops.

3.4.3.5 How to run Javascript? JavaScript support is built for all popular web browsers, including Internet Explorer, Chrome, Firefox and Safari. It will be run when the customer visits the website using web browsers that support JavaScript (most) and JavaScript enabled (default).

There are many pre-written JavaScript codes for you to add directly to your website. All you need to know to be able to use such scripts is how to paste the provided code into the required locations in your website.

The Listing 6 shows how to use JavaScript directly in HTML, this code allows users to see the current time by clicking on the button available in their browser. JavaScript can create buttons, call date values and return results to users quickly.

```
<html>
<body>
<h1>JavaScript example</h1>
<button type="button"
onclick="document.getElementById('example').innerHTML = Date()">
Click here to see the time.</button>
<p id="example"></p>
</body>
</html>
```

Listing 6: JavaScript example.

Figure 7 is the result of the JavaScript code above.

3.4.3.6 Development of JavaScript

3.4.3.6.1 JQuery jQuery is a library built from Javascript that makes it easier for developers to build functions that use Javascript[13]. jQuery integrates many different modules

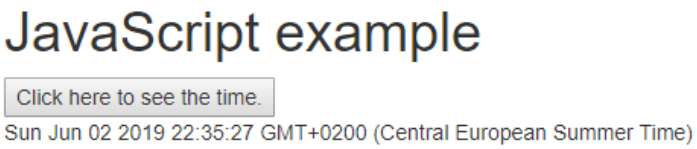

Figure 7: Result of the JavaScript example

from the effect module to the selector query module. jQuery is used up to 99% of the total websites in the world (except for websites using JS Framework).

3.4.3.6.2 Node.js NodeJS is a source code based on the Javascript V8 platform, it is used to build web applications such as video clip pages, forums and especially narrow-range social networking sites. NodeJS is an open source widely used by thousands of developers worldwide[14]. NodeJS can run on many different OS platforms from WIndow until Linux, OS X so that is also an advantage. NodeJS provides rich libraries in the form of Javascript different modules simplify programming and reduce time at the lowest level.

3.4.3.6.3 CoffeeScript CoffeeScript is built on JavaScript and it compiles into JavaScript so you can run it on a web browser or use it with technologies such as Node.js for server applications. CoffeeScript provides a clear syntax that is very attractive to those who like Python or Ruby[15].

3.4.4 Angular

3.4.4.1 What is Angular? Angular is a very powerful Javascript Framework and is often used to build a Single Page Application (SPA) project. It works based on extended HTML attributes (attributes according to Angular rules)[23][24]. This is an open source framework that is completely free and used by thousands of programmers around the world. We now have Angular version 7.

3.4.4.2 Features of AngularJS

- AngularJS is a powerful JavaScript-based development framework for creating Rich Internet Applications (RIA).
- AngularJS provides programmers with the option to explicitly write client-side applications in the MVC (Model View Controller) model.
- The application written by AngularJS is compatible with many web browser versions. AngularJS automatically handles JavaScript code to match different browser.

- AngularJS is a completely free, open source, used by thousands of developers around the world. It works under the Apache License version 2.0 license.

3.4.4.3 Advantages of AngularJS

- Angular helps to improve the productivity of programmers: Angular combined with Typescript, we have a great tool to help dealing with JS's limited issues such as checking data types, refactor code more fully, ... which also supports better debugging, specifically, helping developers really understand their source code better.

- Clear development structure: Angular uses the class in ES10 (ECMAScript2019) with a variety of properties to build the entire key structure, provide a clear structure to build each feature for your application. When it comes to integrating any add-in, like HTTP or Router, we just need to add it inside the class Constructor.

- Angular helps to minimize the size and maximize the performance of the application: Size and performance are intimatingly related when we work on a Web platform. A smaller component will help to improve performance - reduce both downloading and compiling time on the browser. Reducing component size and increasing productivity is an advantage that Angular wants to bring to developers.

- AngularJS source code automatically fittes with different browsers so we don't need to worry about browser compatibility issues. AngularJS applications can run on most web browsers, even Android platforms and IOs.

- Angular is open source, completely free. Angular also has a very large user community, developed by the Google giant, making Angular constantly grow with updated versions.

3.4.4.4 Disadvantages of AngularJS

- Unsafe: A JavaScript framework, an application written by AngularJS is not secured. Security and server-side authentication features are required to make the application more secured.

- Dependent: If the user disables javascript, we can only see a basic page, without nice functions or interfaces.

3.4.4.5 How to use AngularJS The AngularJS framework can be divided into the following three main parts:

- ng-app: This directive defines and links an AngularJS application to HTML.

- ng-model: This directive binds the value of AngularJS application data to HTML input controls.

- ng-bind: This directive binds AngularJS application data to HTML tags.

```
<!DOCTYPE html>
<html ng-app>
<head>
   <title>Hello World</title>
   <script src="https://ajax.googleapis.com/ajax/libs/angularjs
      /1.2.12/angular.min.js"></script>
   <script src="script.js"></script>
</head>
<body>
   <h1>Hello Angular</h1>
</body>
</html>
```

Listing 7: AngularJS example.

The Listing 7 is an example of how to use AngularJS. With:

- angular.min.js is angular's library file.
- script.js is a javascript file containing the source code written by us.
- The ng-app attribute of the HTML tag will mark this as a start of the AngularJS document.

3.4.5 React

3.4.5.1 What is React? React (React.js or ReactJS) is an open source JavaScript library to build the interface, created by Facebook in March 2013. React is currently an only library, not a framework, and corresponds to part V in the MVC model. React is put into practical use by Facebook for their Facebook Ads project. Instagram, Netflix or Airbnb, .. also started putting React into use for their projects[25].

3.4.5.2 Advantages of ReactJS

- One of the unique features of Reactjs is that data rendering can not only be performed on the server layer but also on the client layer.
- Help to write Javascript easier with JSX: React using a new syntax called JSX (JavaScript XML). It is a mix of Javascript and XML syntax: enabling quoting like HTML and using HTML tag to render sub-components. Thus, it also becomes more friendly with front-end programmers.

- Component interface: React Component API allows programmers to create Components corresponding to parts of the interface. These components can be reused as a layout template, or combined with other components to build the content of the interface.
- Increase performance with Virtual DOM: React uses the virtual DOM concept to recreate your components even when the component is "live". This approach gives you great flexibility and improves performance because React can calculate in advance what changes need to be done in the DOM and only update the DOM according to those changes.
- SEO friendly: We can run React on the server and the component virtual DOM will be rendered and the browser will be returned as a web page without the need for 3rd party libraries or any tricks, thus, making React SEO friendly.
- The big brains are "backing" behind React: React is Facebook opensource and is developed by many good developers in the world, so the future of React is also extremely assured.

3.4.5.3 Disadvantages of ReactJS

- Reactjs only serves the View layer. React is just View Library, it is not a MVC framework like other frameworks. This is just a Facebook library that helps to render views. So React will not have Model and Controller parts, but it must be associated with other libraries. React will not have 2-way binding or Ajax.
- Integrating Reactjs into traditional MVC frameworks requires reconfigurations.
- React is quite heavy compared to other frameworks with dimensions similar to Angular.

3.4.5.4 How to use ReactJS? An example of using ReactJS is to create a JSX file that includes JavaScript and XML, which makes writing templates easier and faster thanks to optimization while compiling code into JavaScript. Listing 8 is an example of an HTML file, Listing 9 is an example of a JSX file. The results are displayed on the new page with the words "Hello World" that we often saw.

```
<div id="container">
    <!-- Hello World will appear here-->
</div>
```

Listing 8: ReactJS - HTML file.

```
class Hello extends React.Component {
  render() {
    return <div>Hello {this.props.name}</div>;
  }
```

```
}
ReactDOM.render(
  <Hello name="World" />,
  document.getElementById('container')
););
```

Listing 9: ReactJS - JSX file.

In my project, I don't use Angular or React technology. I have used the standard technology for website development as ASP.NET MVC. At the moment, I haven't worked with Angular and React yet, but I will learn and use them in the future because of their usefulness.

4 Used technologies

4.1 Operating system

4.1.1 Windows

Windows[16] is a popular operating system for computers, supported and developed by Microsoft, and most of the software I need to use for this project is from a Microsoft publisher. Therefore, the operation will become easier and smoother.

4.2 Data Layer

4.2.1 SQL

SQL[17] is a structured, popular query language. The popularity of SQL in programming database systems also makes initialization quick, and editing becomes easier.

4.2.2 Microsoft SQL Server 2014

Microsoft SQL Server[18], also known as MSSQL or SQL Server, is a database system from Microsoft. An independent software platform, it uses both command line interface and GUI interface. The software that supports creating new, maintaining a database. In addition, it can analyze data by SSAS - SQL Server Analysis Services and create reports using SSRS - SQL Server Reporting Services.

4.3 Application layer

4.3.1 ASP.NET (MVC)

ASP.NET MVC[19] is a web application framework developed by Microsoft that allows the use of HTML, CSS, and JavaScript scripts. It divides the application's model into three parts - model, controller and view. MVC is an in-depth, simple testing architecture that integrates with existing ASP.NET features (like with Web Forms applications). Thanks to the MVC model, ASP.NET MVC helps optimize applications and is easy to program and create interfaces. The use of HTML and CSS web design technology makes web interface design easier and more flexible. Site performance will increase compared to web forms because ASP.NET MVC does not use view state.

4.3.2 C#

C#[20] is Microsoft's object-oriented programming language, developed based on C++ and Java. C# is designed to work directly with .NET. C# created to facilitate the exchange of information and services to enable developers to create highly mobile applications. C# is built on the basis of

strong programming languages, thus inheriting the advantages of those languages, and limiting the shortcomings of the previous languages. As a result, programmers are very accessible and easy to develop in the future.

4.3.3 Visual Studio 2017

Visual Studio[21] is one of Microsoft's most famous programming support tools, and no software can replace it. Visual Studio supports many programming languages such as C, C++, C#, HTML, CSS, and JavaScript. Its interface is very easy to use and flexible, tools to support debugging are easy. Therefore, Visual Studio is a collection of complete development toolset to build a .NET Framework application.

4.4 Presentation Layer

4.4.1 HTML5

HTML5[5] is the language released with the main purpose of improving the World Wide Web user experience. The most special thing of HTML5 is that it has high version audio and video support, which is not the main component of the previous HTMLs. Offline Caching saves offline caching on the browser, allowing users to view the content of pages viewed when there is no network connection, which also helps the website save bandwidth and speed up web browsing. HTML5 helps developers optimize HTML source code in previous versions. In addition, HTML5 also helps increase the ranking of the website thanks to search engine optimization. The compatibility with many browsers of HTML5 is also a strong point of this language, this will make the site use it to become more popular in many web environments. HTML5 also optimizes mobile, making it easier and better to show on the web and mobile apps.

4.4.2 CSS3

CSS3[11] is the latest version of the Cascading Style Sheets language and mainly focuses on extending the CSS2.1 version. It is divided into several modules and each module will have different tasks when combining them together will create great effects. CSS3 is compatible with HTML5, so the layout of the content becomes clearer and easier to understand. Media Queries supports compatibility with multiple screen sizes, increasing application flexibility. In addition to interface support, CSS3 also eliminates redundant code in HTML when using attribute tags in HTML is no longer necessary as before. CSS3 brings website synchronization and strong compatibility with most browsers.

4.4.3 JQuery

JQuery[13] is a new style library written from JavaScript that is fast, small, multi-platform and feature-rich. JQuery makes browsing HTML documents easier. Handling and executing

AJAX operations becomes simpler. In addition, with a large development community and many plugins, JQuery meets most of the needs of programmers at the present time.

4.4.4 Photoshop

Photoshop[22] is the graphics software that has the main effect of image editing. Developed and released by Adobe. Currently, Photoshop is considered the most powerful bitmap graphics software on the market and is used by most graphic designers and photographers. In addition to professional photo editing, Photoshop also supports designing by combining pictures with text, colors and arranging them into a complete product.

5 Implementation

IS is a very practical system with a friendly interface. The Figure 8 is the image of the webmaster's main interface. On this interface, we will clearly see the main functions of IS, including creating advertising videos, managing advertising videos, information about IS companies and members, ... We will analyze those functions of IS.

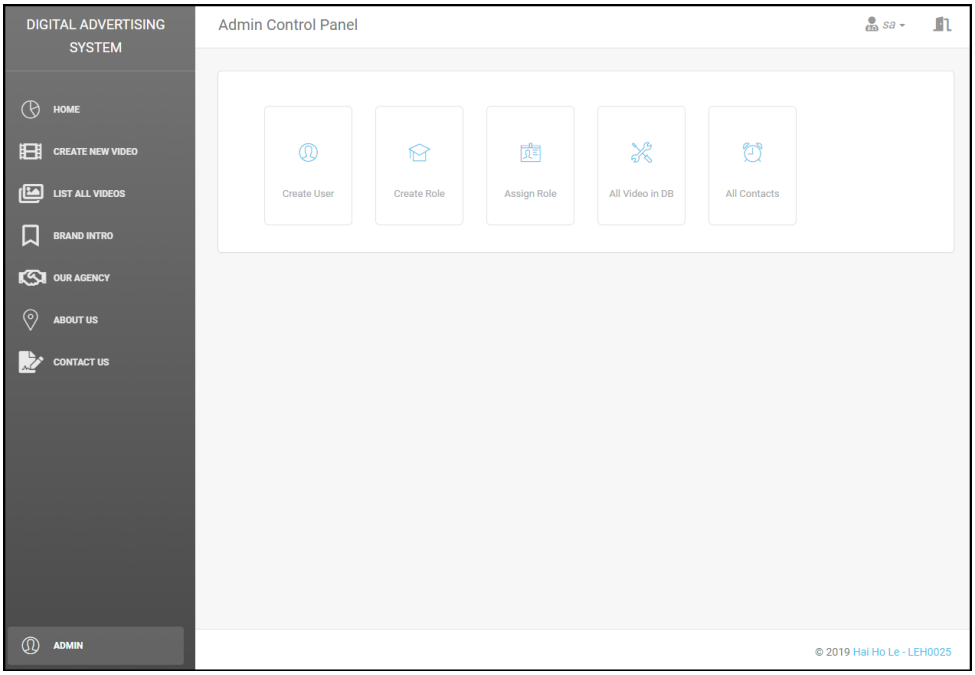

Figure 8: Administrator interface

5.1 Create advertising videos

The advertising video creating function is shown in "public ActionResult CreateSlide (AdsData model)" in the source code file. Users will have two choices in the creation of this advertising video. The first is to create advertising videos from the photo list as a slide show and create advertising videos from the video as a trailer. Because the source code is too long, we will break the source code into some parts to describe them.

```
        DirectoryInfo OutVideoLocation;
          DirectoryInfo OutLogoLocation;
          bool ShowOnAgencyPage = false;
          if (ModelState.IsValid)
          {
              //Upload data
              var ServerSavePath = Server.MapPath("~/UploadedFiles/{0}");
```

```
            var listImgPath = new List<string>();

            if (model.image != null)
            {
                foreach (HttpPostedFileBase img in model.image)
                {
                    if (img != null)
                    {
                        var InputFileName = Path.GetFileName(img.FileName);
                        //Save file to server folder
                        img.SaveAs(string.Format(ServerSavePath,
                            InputFileName));
                        listImgPath.Add(string.Format(ServerSavePath,
                            InputFileName));
                    }
                }
            }
            if (model.VideoFile != null)
            {
              model.VideoFile.SaveAs(string.Format(ServerSavePath, model.
                  VideoFile.FileName));
            }
            if (model.AudioFile != null)
            {
              model.AudioFile.SaveAs(string.Format(ServerSavePath, model.
                  AudioFile.FileName));
            }
            if (model.BrandLogoFile != null)
            {
              model.BrandLogoFile.SaveAs(string.Format(ServerSavePath, model
                  .BrandLogoFile.FileName));
            }
     //more source code will be here
    }
```

Listing 10: Create advertising videos 1.

Listing 10 is the first part of this function, which will initialize the initial variables to contain input for the advertising video creating function. Input data such as photos, videos, audios, logos will be checked for availability and then saved to the "UploadedFiles" folder for video creation

in the following steps. Because the input data can be a list of photos, we have created a list of photos to serve as a function of creating videos.

```
OutVideoLocation = Directory.CreateDirectory(string.Format(Server.MapPath("~/
    Videos/{0}/"), User.Identity.GetUserId()));
OutLogoLocation = Directory.CreateDirectory( string.Format(Server.MapPath("~/
    BrandLogo/{0}/"), User.Identity.GetUserId()));
```

Listing 11: Create advertising videos 2.

Listing 11 performs the creation of the file folder after rendering, the folder "Videos" will contain the completed video, the "BrandLogo" folder will contain the brand's logo to serve the classification function.

```
if (model.VideoFile == null) //render slide
                {
                    var SliData = new SlideshowData
                    {
                        AudioFile = string.Format(ServerSavePath, model.AudioFile
                            .FileName),
                        image = listImgPath,
                        OverrideOut = model.OverrideOut,
                        SloganText = model.SloganText,
                        RenderType = model.RenderType,
                        VideoOutFile = OutVideoLocation.FullName + model.
                            VideoOutFile + ".mp4",
                    };
                    if (model.BrandLogoFile == null)
                        SliData.BrandLogoFile = "";
                    else
                        SliData.BrandLogoFile = string.Format(ServerSavePath,
                            model.BrandLogoFile.FileName);
                    Task ad = new Task(() => EasyRender.RenderSlideshow(SliData,
                        Server.MapPath("~/Resources/ffmpeg.exe")));
                    ad.Start();
                    if (UserProcess.CountVideoOfUser(User.Identity.GetUserId()) <
                         1)
                        ShowOnAgencyPage = true;
                    VideoFileModel newVideo = new VideoFileModel
                    {
                        Name = model.VideoOutFile,
                        IdUser = User.Identity.GetUserId(),
```

```
                Location = string.Format("/Videos/{0}/{1}.mp4", User.
                    Identity.GetUserId(), model.VideoOutFile),
                IsRenderFinish = false,
                IsShowOnAgency = ShowOnAgencyPage
            }; UserProcess.CreateVideo<VideoFileModel>(newVideo);

            if (UserProcess.CountUserBrand(User.Identity.GetUserId()) <
                1)
            {
                var Temp = HttpContext.Server.MapPath("~/UploadedFiles/"
                    + model.BrandLogoFile.FileName);
                var LogoFile = Temp.Replace("UploadedFiles", "BrandLogo\\
                    " + User.Identity.GetUserId());
                System.IO.File.Move(Temp, LogoFile);
                var newBrand = new UserBrandModel
                {
                    IdUser = User.Identity.GetUserId(),
                    Logo = string.Format("/BrandLogo/{0}/{1}", User.
                        Identity.GetUserId(), model.BrandLogoFile.FileName
                        ),
                    Slogan = model.SloganText,
                    Intro = string.Format("/Videos/{0}/{1}.mp4", User.
                        Identity.GetUserId(), model.VideoOutFile)
                }; UserProcess.CreateUserBrandInfo<UserBrandModel>(
                    newBrand);
            }
        }
```

Listing 12: Create advertising videos 3.

Listing 12 makes creating videos from a list of photos, combining audio, logo and slogan of users. In this step, the system will call the render API to create the video. The system will check the availability of data and perform rendering with previously saved data, including audio, photo list, slogan, the output file name will be created with an extension of .mp4 to facilitate the presentation of advertising videos with HTML5 video API. In the next step, the system will check the existence of the newly created video to save information to the "newVideo" created with the purpose of containing the newly created video information (user name, user id, saved address) to use for listing the brands of the system. The final step is to create videos with the user data included. The final "if" statement in this section is to include the user's newly created data (advertising video, logo) into the "newBrand" variable for use in the system's Brand

Information function.

When the "if" statement has ended, the system has finished the process of creating an advertising video from the photo list combining sound, logo and slogan. The same part of creating an advertising video from a video is similar and done in the "else" statement. The "else" statement is executed when the user selects the function of creating an advertising video like a photo slide. After executing the "else" statement, the system will redirect the user to the "LoadVideoFile" action and end this function.

5.2 LoadVideoFile function

This function helps to check the availability of the newly created video (because it will take a while for the video creation process to complete), so if we want to see the results we have to check the status video.

```
public ActionResult LoadVideoFile()
        {
            List<VideoFileModel> videoFiles = new List<VideoFileModel>();
            var data = UserProcess.LoadVideoByIdUser<VideoFileModel>(User.
                Identity.GetUserId());
            foreach (var item in data)
            {
                bool StatusIsFinish = false;
                if (!item.IsRenderFinish)
                {
                    FileStream stream = null;
                    try
                    {
                        var vfilePath = HttpContext.Server.MapPath("~" + item.
                            Location);
                        var vfile = new FileInfo(vfilePath);
                        stream = vfile.Open(FileMode.Open, FileAccess.Read,
                            FileShare.None);
                    }
                    catch (IOException)
                    {
                        //the file is unavailable because it is:
                        //still being written to
                        //or being processed by another thread
                        //or does not exist (has already been processed)
                        //return true;
```

```
                continue;
            }
            finally
            {
                if (stream != null)
                    stream.Close();
            }
            //file is not locked, so update IsRenderFinish to TRUE
            UserProcess.UpdateVideoStatus<VideoFileModel>(item);
            StatusIsFinish = true;
        }
        var DateShowText = item.DateShow.GetValueOrDefault();
        videoFiles.Add(new VideoFileModel
        {
            DateCreate = item.DateCreate,
            Location = item.Location,
            Name = item.Name,
            Id = item.Id,
            DateShow = item.DateShow,
            IsRenderFinish = StatusIsFinish
        });
    }
    return View(data);
}
```

Listing 13: LoadVideoFile function.

This function is shown in listing 13. The system will check all videos that are in the user's directory, and the system will run a "try-catch-finally" command to check the status of the video just created, the system will open the file until the video creation step is complete. The variable "StatusIsFinish" will have a "true" value when the process is complete. At the end of this process, the system will record all information about the newly created video including creation time, location, name, video id and video status. And that information is also used for the function of listing the videos in the system, helping to manage.

5.3 Function Select the slide show time

The system will be divided into 12 time-frames of the video, the user's advertising video will be broadcast in a time-frame starting from 0 to 2 hours, or from 2 hours to 4 hours, ...Listing 14 will show this.

```
public ActionResult SetSchedule(int id)
        {
            VideoFileModel videoFile = UserProcess.LoadVideoById<VideoFileModel
                >(id);
            ViewBag.TimeSlot1 = UserProcess.CountVideoByTimeRange(new TimeSpan
                (0,0,0), new TimeSpan(1,59,59));
            ViewBag.TimeSlot2 = UserProcess.CountVideoByTimeRange(new TimeSpan
                (2,0,0), new TimeSpan(3,59,59));
            ViewBag.TimeSlot3 = UserProcess.CountVideoByTimeRange(new TimeSpan
                (4,0,0), new TimeSpan(5,59,59));
            ViewBag.TimeSlot4 = UserProcess.CountVideoByTimeRange(new TimeSpan
                (6,0,0), new TimeSpan(7,59,59));
            ViewBag.TimeSlot5 = UserProcess.CountVideoByTimeRange(new TimeSpan
                (8,0,0), new TimeSpan(9,59,59));
            ViewBag.TimeSlot6 = UserProcess.CountVideoByTimeRange(new TimeSpan
                (10,0,0), new TimeSpan(11,59,59));
            ViewBag.TimeSlot7 = UserProcess.CountVideoByTimeRange(new TimeSpan
                (12,0,0), new TimeSpan(13,59,59));
            ViewBag.TimeSlot8 = UserProcess.CountVideoByTimeRange(new TimeSpan
                (14,0,0), new TimeSpan(15,59,59));
            ViewBag.TimeSlot9 = UserProcess.CountVideoByTimeRange(new TimeSpan
                (16,0,0), new TimeSpan(17,59,59));
            ViewBag.TimeSlot10 = UserProcess.CountVideoByTimeRange(new TimeSpan
                (18,0,0), new TimeSpan(19,59,59));
            ViewBag.TimeSlot11 = UserProcess.CountVideoByTimeRange(new TimeSpan
                (20,0,0), new TimeSpan(21,59,59));
            ViewBag.TimeSlot12 = UserProcess.CountVideoByTimeRange(new TimeSpan
                (22,0,0), new TimeSpan(23,59,59));
            ViewBag.TimeStart = new List<string> { "0-2", "2-4", "4-6", "6-8", "
                8-10", "10-12",
                    "12-14", "14-16", "16-18", "18-20", "20-22", "22-24" }.
            Select(r => new SelectListItem { Value = r.ToString(), Text = r.
                ToString() });
            return View(videoFile);
        }
```

Listing 14: Function Select the slide show time.

In Listing 15, the system will create 12 variables and assign that value to 12 time-frames. In listing 15, the system gets the value that the user has chosen according to the time frame

above, then the system will convert the value that the user has chosen to the string data type and assign that value to the "convertDateTime" variable for the "LoadVideoFile" function.

```
public ActionResult Set(FormCollection form)
        {
            VideoFileModel videoFile = new VideoFileModel();
            videoFile.Id = int.Parse(form["custId"]);
            var ttime = form["TimeStart"].Split('-')[0];
            if (Convert.ToInt16(ttime) < 10)
                ttime = "0" + ttime;
            string convertDateTime = form["DateShow"] + " " + ttime + ":00:00";
            videoFile.DateShow = DateTime.ParseExact(convertDateTime, "MM/dd/
                yyyy HH:mm:ss", CultureInfo.InvariantCulture);
            UserProcess.CreateVideoSchedule<VideoFileModel>(videoFile);
            return RedirectToAction("LoadVideoFile");
        }
```

Listing 15: Function Set the slide show time.

5.4 Function to play videos on the homepage

After the user selects the time to play the video, the system will save the time information that the user has selected and to the step of playing the video in the same time frame. Listing 16 shows this. The system will create the "current" variable to use to a comparison with the data of the selected user. Next, the system will create the "CurShift" variable to compare the value of "current" and save the value from the start and end time respectively in the system's 12 time-frames. For example "current" is 01:50:59, "CurShift" will have "Start" value of 00:00:00 and "End" value is 01:59:59. In the next step, the system will check how many videos have the same time-frame and will randomly play those videos in the selected time frame. For example, there are 3 videos shown during from 00:00:00 to 01:59:59, each time we refresh the homepage, the rate of 3 videos appearing in that time frame will be random. If there is no video in that time frame, the system will run the default video "video1.mp4".

```
public ActionResult video()
        {
            //var current = DateTime.Now.TimeOfDay;
            var current = DateTime.Now.TimeOfDay;
            var shift = new List<TimeShift>() {
                new TimeShift(new TimeSpan(0,0,0), new TimeSpan(1,59,59)),
                new TimeShift(new TimeSpan(2,0,0), new TimeSpan(3,59,59)),
                new TimeShift(new TimeSpan(4,0,0), new TimeSpan(5,59,59)),
```

```
            new TimeShift(new TimeSpan(6,0,0), new TimeSpan(7,59,59)),
            new TimeShift(new TimeSpan(8,0,0), new TimeSpan(9,59,59)),
            new TimeShift(new TimeSpan(10,0,0), new TimeSpan(11,59,59)),
            new TimeShift(new TimeSpan(12,0,0), new TimeSpan(13,59,59)),
            new TimeShift(new TimeSpan(14,0,0), new TimeSpan(15,59,59)),
            new TimeShift(new TimeSpan(16,0,0), new TimeSpan(17,59,59)),
            new TimeShift(new TimeSpan(18,0,0), new TimeSpan(19,59,59)),
            new TimeShift(new TimeSpan(20,0,0), new TimeSpan(21,59,59)),
            new TimeShift(new TimeSpan(22,0,0), new TimeSpan(23,59,59)),
        };
        var CurShift = shift.Where(x => x.Start <= current && x.End >=
            current).FirstOrDefault();

        if (CurShift != null)
        {
            var st = DateTime.Parse(CurShift.Start.ToString());
            var ed = DateTime.Parse(CurShift.End.ToString());
            var vidLinks = UserProcess.ShowVideoOnHome(st.ToString("yyyy-MM-
                dd HH:mm:ss"), ed.ToString("yyyy-MM-dd HH:mm:ss"));
            if (vidLinks != null && vidLinks.Count() > 0)
            {
                int r = rnd.Next(vidLinks.Count);
                return Content(vidLinks[r]);
            }
        }
        //Show default video
        return Content("/Videos/video1.mp4");
    }
```

Listing 16: Function to play videos on the homepage.

6 Discussion

This project is very practical and has a lot of potentials. In the future, IS will be further expanded with many new improvements, both in terms of presentation and interface, as well as on database and functionality.

Specifically, the system will not only show customers' products on the home page but also show on large screens in public places, hospitals, public bus stations, using Android Box technology. Android application will be deployed to receive information from the server and display the content. On the other hand, it also sends sequential update signals to the server. Moreover, this application downloads and saves data to local memory to ensure stable running status and can play in offline mode when an unexpected network error occurs. Figure 9 will help us to visualize this issue easier.

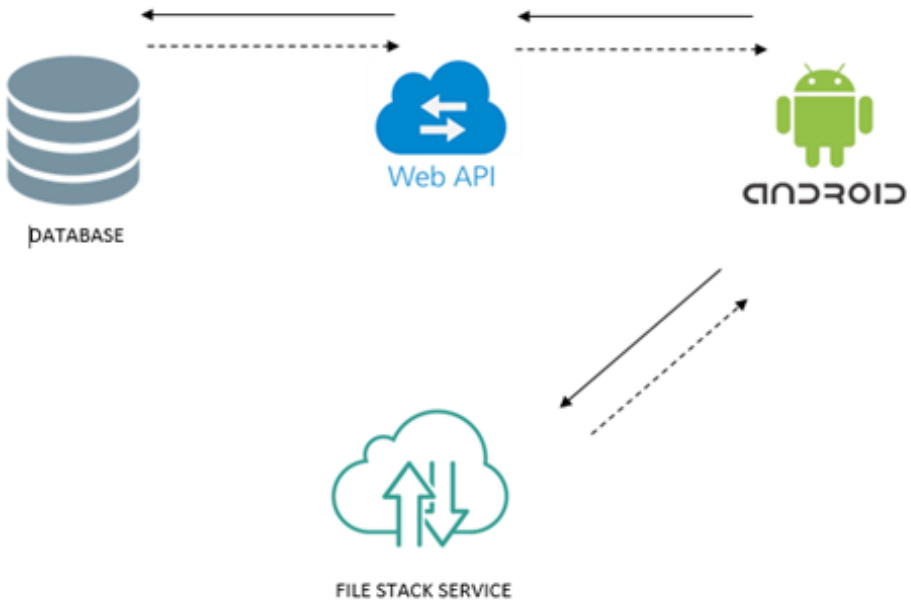

Figure 9: Android Box working

The Database upgrade is also extremely important. In the database part, the system will have a Box table to store the information of Android Boxes for presentating in many locations. The Location table will contain information, the location of the screens as well as the Android Box being convenient for management and presentation. Screen table, Device table will save the screen information corresponding to Android Box, so that the editing will become easier. The system will have more layout for users to choose, they can edit the layout according to their discretion, and Layout table will save information about this part. Figure 10 describes the database to be expanded in the future.

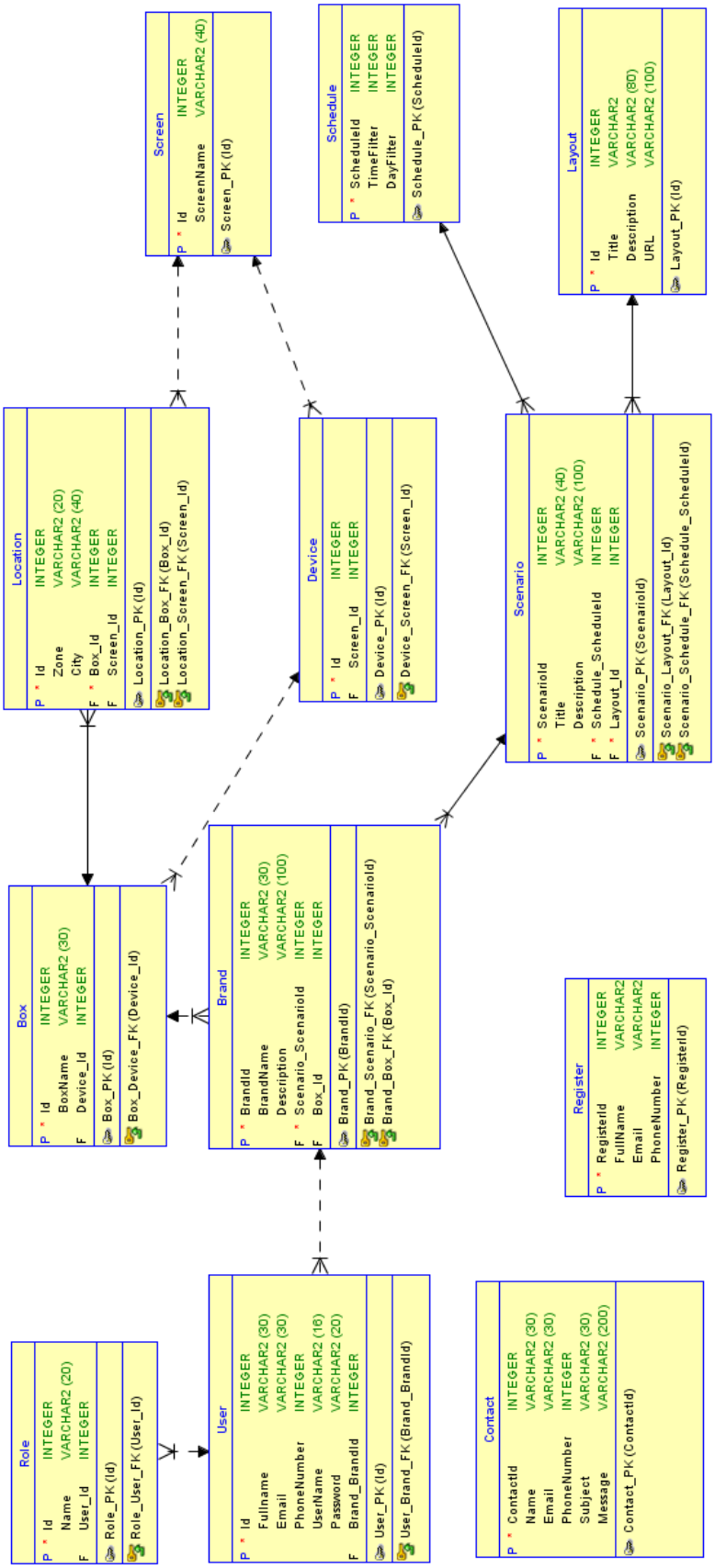

Figure 10: New Database

7 Conclusion

In this bachelor's dissertation, I analyzed, handled, designed and implemented the Digital Advertising System. In the analysis section, I studied the market and compared the competitiveness of existing advertising models with my system. I learned what to avoid and what I can improve to increase user browsing experience. In terms of interface, I designed almost all the functions necessary for user experience, with simple but delicate colors. I focus on the usefulness and simplicity in the process of use, so users' activities are recorded for analysis and possible improvements. The interface is not too complicated, the system is logic and thus easy to use. Managing login information, product presentations and restricting automatic registration to minimize bad situations can make the system, such as database, overloaded. An integral part of system development is analyzing and building databases. This part helps us have a more general view of the system, to consider the necessary functions that will be presented in the system, to bring about high efficiency for improving user experience. Database analysis also helps us better understand what data should be included in the system and estimate the amount of data the system can handle. The system has no problem with the database. I believe that creating an information system is a very complex issue. The developer of an information system needs a broad programming knowledge. For a large information system, with hundreds of functions working together, if the developer wants them to work correctly, then the developer must properly understand the links in the system and the steps must be reasonable. I can't say that my system is perfect. There could be more untreated errors. I am waiting to implement it, developing this system in the future. In fact, systems like that are regularly repaired and improved according to consumers' needs from time to time. I am confident that I can handle flexibility in system development and innovation in the near future.

As mentioned above, my system needs more time and resources to expand and improve. I intend to improve the database and product presentation technology in the near future, and I can do it. Digital Advertising System is an information system that helps users create an advertising video product that expresses personality, send the messages they want. I have completed the first step in creating advertising videos and presenting them on the homepage. So I will confidently say that Digital Advertising System will be popular in a commercial environment, where it will serve a large number of users.

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